

Aircraft Hangar Heating

**A guide to application and
selection**

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ENERGY EFFICIENT HEATING SYSTEMS

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Presentation

- **Company introduction**
- **Hangar heating - factors to consider**
- **Comparison of heating systems**
 - Case study
 - Benefits and limitations
- **Product overview**
- **Open forum**

Company Overview



- Established 1979
- Privately owned
- 215 employees
- \$ 35m GROUP TURNOVER

Company Development

- World wide market leader in radiant
- Export to over 35 countries
- Largest individual market is USA
- Facilities in IN, NC, CO, UT, TX
- Distributor network throughout USA
- Established over 20 years in USA

Mission Statement

- To establish and maintain world-class status in the provision of energy-efficient heating solutions
- We aim to deliver
 - Innovative products
 - Quality service
 - Value for money
 - Total customer satisfaction at all times

Company Standards

- **Quality assurance**
 - BS EN ISO 9000: 2000
 - All products CSA / AGA approved
 - Member of GAMA

Over 200 Military and Hangar Installations Worldwide

- Buckley AFB, CO
- Elemendorf AFB, AK
- Fairchild AFB, WA
- Fort Carson AB, CO
- Kelly AFB, TX
- Little Rock AFB, AR
- McConnell AFB, KS
- Malmstrom AFB, MT
- Oceana Naval Air Station, VA
- Pueblo Army Depot, CO
- Sulfridge ANG, MI
- Stockton ANG, CA
- Tyndall AFB, FL
- Warren AFB, WY

Military Buildings

- Aircraft hangars
- Vehicle workshops and storage
- Storage areas and warehouses
- Garages
- Sports facilities
- Museums

Commercial References

- American Airlines
- BP
- Chevrolet
- Chrysler
- Delta Airlines
- Eli Lilly
- Firestone
- Green Bay Packers
- Hyundai
- Isuzu
- Lowes
- Nabisco
- Nissan
- Norwest Airlines
- Shell
- Schneider
- US Postal Service
- Wal-Mart

Hangar Heating - Factors to be considered

Requirements of Buildings

- Large interior spaces - high roofs. Large volume of air
- Older buildings poorly insulated - prone to high air change rates
- Hangar doors can be left open - high air infiltration disrupts comfort conditions
 - Especially in exposed locations
- Rapid recovery to temperature essential
- Space can be used intermittently and sometimes partially
- Zone control is essential if energy is to be managed efficiently

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Viabile Alternatives

- **Wet systems**
 - HTHW radiant panels
- **Dry systems**
 - Gas fired radiant tube
 - Gas indirect fired warm air

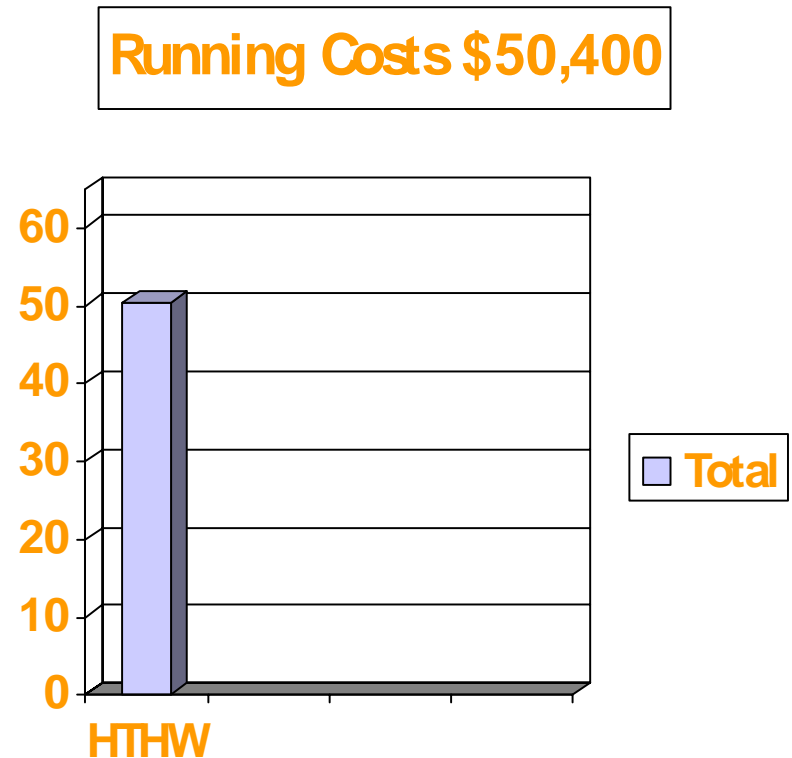
A large, high-ceilinged hangar with a complex steel truss roof structure. The interior is filled with several military aircraft, including a prominent Type C Hawk fighter jet in the foreground. The aircraft are painted in dark grey with yellow and black checkered patterns on the nose and tail. The hangar is well-lit with overhead lights, and various maintenance equipment and scaffolding are visible on the floor.

Heating System Comparison

A Case Study - RAF Type C
Hangars
(Source data : RAF Coltishall)

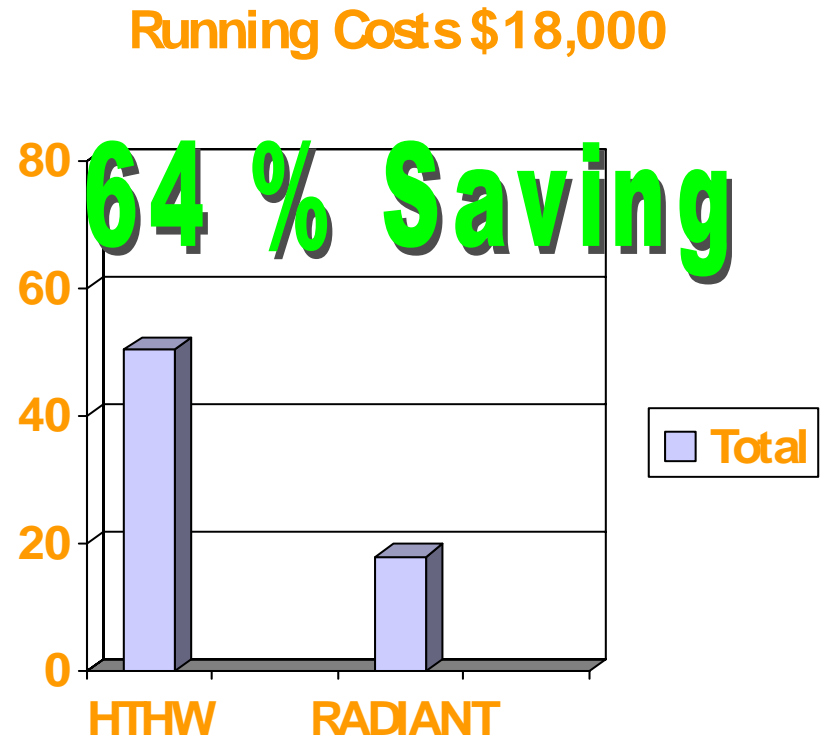
Option #1 HTHW System

- **Energy consumption**
 - 136,480 therms p.a.
- **Actual running cost**
 - \$ 50,400



Option #2 Gas Fired Radiant

- Energy consumption
 - 48,743 therms p.a.
- Actual running cost
 - \$ 18,000



Radiant Heating - An Overview

What is Radiant Heat?

- Heat transfer by radiation involves two objects at different temperatures separated by a space transparent to the radiation
- Radiant or infra-red heating is the transfer of energy by means of electromagnetic waves (comparable to “light” - differs in frequency)
- When the waves strike an object they stimulate molecular activity, causing them to move rapidly and to generate heat

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What Is Radiant Heat?

- Properties of radiant energy
- Emitted by hot surfaces
- Travels in straight lines
- Passes through the air without heating it
- Absorbed by cooler solid objects on which it falls

Radiant Heat

How It Is Delivered?

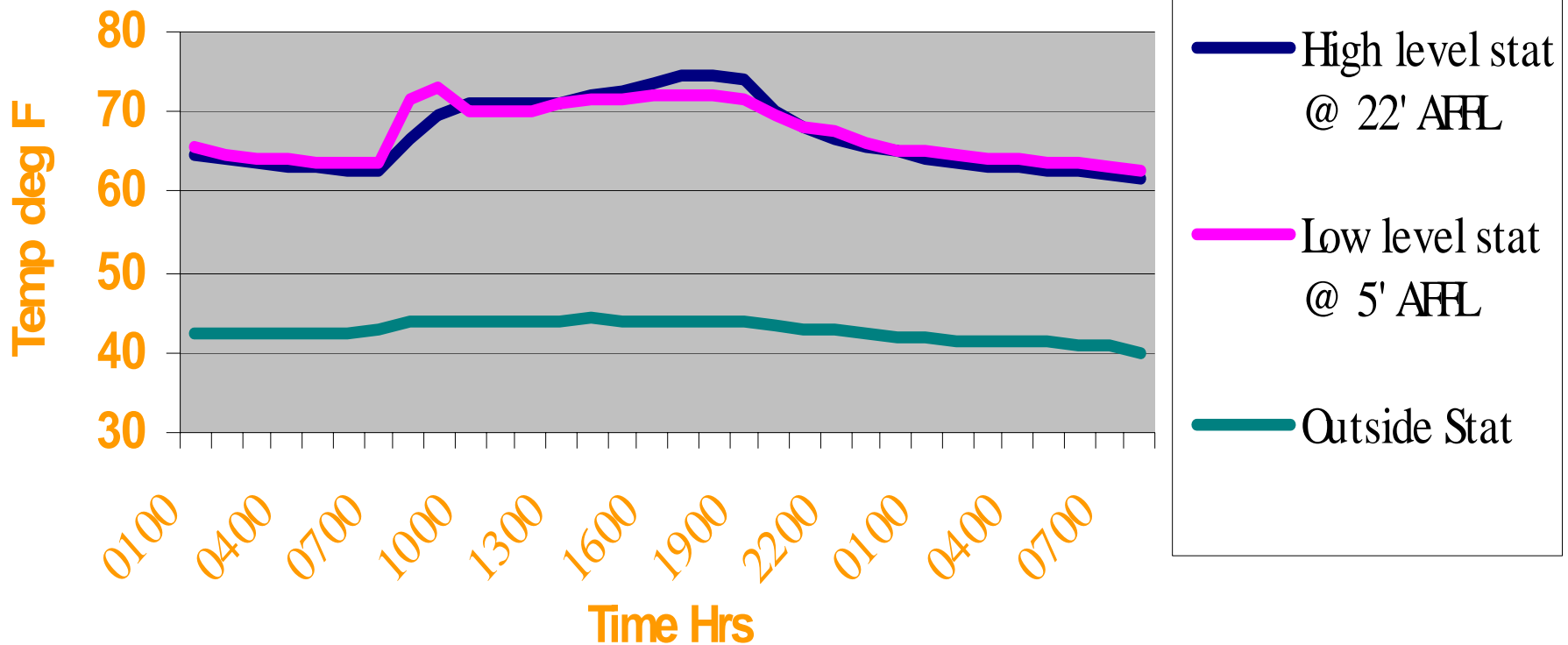
- Mounted overhead
- Gas burner firing into black tube
- Vented via vacuum fan
- Radiant reflected downward by a reflector
- Unitary or system
- Totally enclosed flame
- Fail-safe devices



Gas Fired Radiant Tube Heating The Benefits

- **Creates warmth at low level**
 - Can be mounted up to 100'
- **Does not heat entire volume of the building**
 - Reduced stratification
 - Minimizes roof fabric and ventilation losses
- **Can be zoned and controlled, heating occupied areas only**
- **Provides rapid heat up and recovery**

Case Study - Temp. Stratification 8/9 Feb'01



Gas Fired Radiant Tube Heating The Benefits

- **High efficiency at the point of use-no distribution losses**
- **Warms floors, surfaces and tools, improving working conditions**
- **Eliminates the need for a utility room**
 - **Reducing building and operational costs**
- **Easy to install**

Gas Fired Radiant Tube Heating Savings!

- 10 Year Life Cycle Cost less than initial capital cost of warm air radiant system
- Annual energy cost savings
 - 65% versus HTHW
 - 35% versus warm air
- Minimal maintenance cost.



Product Solutions

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Ambi-Rad Solutions

- Radiant tube
- ER series
 - 40,000 to 150,000 Btu/hr
 - UT, Linear & double linear
 - Venting options
 - Individually flued
 - Herringbone combined flue
- PT heater
 - 60,000 to 225,000 Btu/hr
 - Individually flued
 - 20' to 80' long



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Ambi-Rad Solutions

- Continuous radiant tube
- ARC
 - 40,000 to 157,000 Btu/hr
 - In-line burners
 - Single exhaust point
 - Low intensity
 - Streamlined appearance
 - Over 90% combustion efficiency



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Company Philosophy

- **Provide a supply based service**
 - Contractors –installation support
 - Engineers – design assistance
 - End users – operating costs

Company Services

- **Sales support**
 - Pre-contract
 - Contract
 - Post-contract
- **In house design**
 - Scheme drawings
 - Cost evaluation
 - Heat loss calculations
- **On site support**
 - Technical advice

After Sales Support

- Technical and spares support
- Over night parts availability
- Extended warranties available

Open Forum